



JSC engineers are refining a technique that uses vibrations to inspect airframes. Story on Page 3.



The JSC Office Education Program presented graduation certificates to 52 area high schoolers. Story on Page 4.

# Space News Roundup

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No. 29

## Final solid motor test before STS-26 done Thursday

*Production Verification Motor 1 included intentional flaws to test redesign*

Engineers will crawl inside and begin a close-up inspection this weekend of the results of Thursday's final Solid Rocket Motor (SRM) test firing before the return to flight.

Preliminary results of the firing, designated as Production Verification Motor-1 (PVM-1), were not available at press time.

The motor was fired for two minutes Thursday at Morton Thiokol's Space

Operations facility near Brigham City, Utah, and it had been purposely designed with a number of flaws to test modifications made to the SRMs during the past two and a half years.

"We're trying to show that the redesigned motor can adequately withstand manufacturing and assembly-type defects should they occur," Rodney Lofton, JSC project integration engineer, said early

Thursday.

Richard Kohrs, deputy director of the NSTS Program Office, said the severity of the flaws in the booster is unprecedented in a full-duration test.

"We put in the capture-feature overhang and, if everything works normally, the primary O-ring never sees pressure," Kohrs said. "We want to demonstrate that the primary O-ring will seal if pressure reaches it."

The only way to achieve such a demonstration is to put in flaws, he added. "It's really to verify our design that says the primaries will seal."

In the igniter-to-case joint, PVM-1 had two 5-inch by 0.4-inch artificial edge separations in the motor's forward dome insulation, where the igniter is bolted to the motor. At the same locations, deliberate 1-inch gaps were made in the zinc chromate

putty packed between the igniter body and case insulation.

No intentional flaws were incorporated into the forward field joint.

The center field joint had three built-in flaws, including a 0.125-inch by 0.05-inch channel-type flaw cut into the J-seal bonded insulation to ensure that pressure would reach the capture feature O-ring. There also was a

Please see **SOLID**, Page 4

## Discovery fix going smooth

Repair of the leaky fitting in an oxidizer vent line of *Discovery's* Reaction Control System is now under way and should be completed by the middle of next week.

"Everything is either on or a little ahead of schedule for where we were at this time last week," said Richard Kohrs, deputy director of the NSTS Program Office at JSC. "It's going great and everything looks good."

At about 1 p.m. Wednesday, three Rocketdyne technicians began cutting two rectangular holes with a router through two aluminum bulkheads, the aft wall of *Discovery's* payload bay and a forward wall of the left Orbital Maneuvering System pod. The cutting was completed by 8 a.m. Thursday. Through the access hole into the left Orbital Maneuvering System pod, a clamshell-like clamp, developed by JSC and Rockwell, will be placed over the leaking dynatube fitting, tightened and filled with sealant.

The access hole allows technicians to be about 12 inches from the leak, and they are scheduled to begin putting on the clamshell today. If all goes smoothly, leak checks on the clamshell-covered fitting will be performed this afternoon.

"Repair work on the leak is probably going about a half-day or a day quicker than we expected," Kohrs said.

The repair may be completed by early next week. Found about a month ago by launch pad workers, repair of

the nitrogen tetroxide leak was postponed until after *Discovery's* Flight Readiness Firing (FRF).

Post-FRF external inspections of all three main engines have been conducted and their components appear to be in good shape, indicating no problems with the engines' performance. More detailed inspections of the engines are under way.

Meanwhile, a small amount of hydrogen detected in the 17-inch disconnect cavity during the FRF appears to not be a problem for STS-26. Leak checks and inspections of the area were done earlier this week, and the data is being analyzed by engineers at JSC, Kennedy and Rockwell.

"The recommendation is to fly as-is," Kohrs said Thursday. "We've concluded it is a very small leak within the specifications for flight." A final decision on the matter may be reached today, he added.

The primary payload for STS-26, Tracking and Data Relay Satellite C (TDRS-C), arrived at Launch Pad 39B on Monday. TDRS-C has been inside a protective payload canister filled with an inert gas, but this weekend servicing and fueling of the satellite should begin in the Rotating Service Structure's Payload Changeout Room.

TDRS-C will be installed in *Discovery's* payload bay as soon as the leak repair is completed, the bay readied and the servicing finished. Installation could be as early as Aug. 29.



**STS-26**  
The Return to Flight



NASA Photo

Technician Ed Wilkinson, outfitted in protective garb, works through a hole cut in a mockup of the Orbiter aft payload bay bulkhead during recent simulations held at White Sands as part of the search for a repair of *Discovery's* oxidizer leak.

## Leak keeps White Sands busy

When the oxidizer leak in *Discovery's* Reaction Control System (RCS) was found recently, it resulted in a flurry of activity not only at JSC but also at the White Sands Test Facility near Las Cruces, New Mexico.

When contacted by JSC's Propulsion and Power Division to assist

with the problem, personnel at White Sands quickly became major players in finding a solution for the leak. White Sands' role mainly involved testing hardware and procedures to be used to repair the leak on the same mockup originally used to develop and qualify the Orbiter's aft RCS for manned flight.

"Our first order of business was to take photographs and precisely map out the test article's flight configured line routing," said Regor Saulsberry, operations director and leader of the White Sands team that worked on the leak. "This was necessary for JSC and Marshall to Please see **WHITE SANDS**, Page 4

## Taking care of a national treasure

*Dr. John Dietrich assumes duties as Lunar Sample Curator*

By Kelly Humphries

One of the nation's greatest treasures—the 841-pound collection of lunar material returned to Earth by Apollo—has a new curator at JSC.

Dr. John W. Dietrich, recently promoted to deputy chief of the Planetary Science Branch, has assumed all the duties of Lunar Sample Curator. Dietrich has been working for several years with outgoing curator Doug Blanchard, who has taken on new responsibilities as the head of a combined Planetary Science Branch.

"We consider the collection to be a national treasure, and we try to treat it accordingly," Dietrich said. "I do feel a great sense of responsibility and we have a crew working hands-on with the samples that's extremely stable and they all share that sense of responsibility, which makes my job a lot easier."

Almost 94 percent of the lunar samples returned to Earth are housed in Bldg. 31A, the Lunar Sample Building, Dietrich said. Two percent has been used up in preparation and destructive analyses, 2 percent is on loan to investigators and 2 1/2 percent is in educational displays.

"We have very high security for the physical protection of it. And we have extensive protocol that we follow when we're handling it to avoid contamination as much as possible," Dietrich said.

Tracking and documenting what happens to the loaned samples is a large part of the curator's work, he explained.

"We're trying to be very careful that we know the total history of the sample so that if there are any unusual results in the analyses, we can backtrack and see if there's anything that could have caused those unusual results before

(the investigator) goes out and makes a big pronouncement and finds out that it was something those guys did back in the lab."

Dietrich came to work for NASA in 1968 to work on the lunar exploration program.

"I helped select the targets for photographing the Moon with the lunar orbiters and did the preliminary evaluations of the photos that came back on all five of the orbiter missions," he said.

He also worked with the landing site evaluation group, helped provide geology training for the astronauts who landed on the Moon, and co-authored the photo summaries for three Apollo missions. He also did a stint in the Earth observations area.

Dietrich says that are substantial differences between this job and his previous jobs at NASA.



Dr. John W. Dietrich

## Day of briefings slated for press

A full day of press briefings at JSC Monday will give a complete overview of STS-26 and the upcoming return to flight, including a crew press conference and details on changes in Shuttle design and management.

The briefings will begin at 8 a.m. and end at 5 p.m. in Bldg. 2's Teague Auditorium. Attendance will be limited to working press, however the briefings will be carried live on NASA Select and the center's closed-circuit television system.

The mission preview will kick off with an overview by Larry S. Bourgeois, lead flight director for STS-26. Later in the morning, modifications to *Discovery* and the solid rocket boosters will be discussed by a variety of program officials. At 11 a.m., Robert Crippen, deputy director of Shuttle operations, will discuss changes in

Please see **CREW**, Page 4

JSC

# Dates & Data

## Today

**Cafeteria menu**—Entrees: meat sauce and spaghetti (special), baked scrod, liver and onions, fried shrimp, seafood gumbo. Vegetables: green beans, buttered broccoli, whipped potatoes.

## Saturday

**Defensive Driving**—A course in defensive driving will be offered from 8 a.m.-5 p.m. at the Gilruth Recreation Center. Cost is \$20. For more information, call x30304.

## Sunday

**Family fun day**—The JSC-EAA will sponsor a family fun day at AstroWorld from 10 a.m.-10 p.m. Admission is \$9.95 with an EAA coupon.

## Monday

**Exercise class**—Exercise classes meet every Monday and Wednesday from 5:15-6:15 p.m. in the Rec Center. Cost is \$24 for eight weeks. For more information, call x30304.

**Cafeteria menu**—Entrees: weiners with baked beans (special), grilled ham steak, breaded cutlet with cream gravy, beef chop suey, beef and barley soup. Vegetables: buttered rice, brussels sprouts, whipped potatoes.

## Tuesday

**Mixed bowling league**—Team captains of the NASA Mixed Bowling League will meet at 5:30 p.m. in the Rec Center, Rm. 207, to discuss the upcoming season. New bowlers are welcome. For information, call Chuck Welch, x38634, or Leona Kain at 282-2544.

**Aerobics class**—Aerobics classes

meet every Tuesday and Thursday from 5:15-6:15 p.m. in the Rec Center. Cost is \$24 for eight weeks. Enrollment is open now. For more information, call x30304.

**Cafeteria menu**—Entrees: pepper steak (special), turkey a la king, pork chop with apple sauce, fried shrimp, seafood gumbo. Vegetables: au gratin potatoes, breaded squash, buttered spinach.

## Wednesday

**NMA meeting**—The NASA JSC chapter of the National Management Association (NMA) will meet with a social hour starting at 5 p.m. followed by dinner at 6 p.m. in the Rec Center Ballroom. Jim "Mac" McInvale of Gallery Furniture will speak. For information, call Ann Hammond, x32933.

**Cafeteria menu**—Entrees: Mexican dinner (special), braised beef ribs, fried catfish with hush puppies, seafood gumbo. Vegetables: Spanish rice, ranch beans, buttered peas.

## Thursday

**Softball tournament**—Registration deadline for teams to sign up for the Men's Open C softball tournament scheduled Aug. 27-28 is at 5 p.m. Only the first 14 entries will be accepted. Cost is \$95. Call x30304 for details.

**Cafeteria menu**—Entrees: hamburger steak with onion gravy (special), tamales with chili, chicken and dumplings, corned beef with cabbage and new potatoes, split pea soup. Vegetables: navy beans, buttered cabbage, green beans.

## Aug. 26

**SEDS conference**—The Texas area chapters of the Students for the Exploration and Development of Space will sponsor an international conference at the Nassau Bay Hilton through Aug. 28. The conference will feature JSC tours, a space career exposition and several well known speakers from the space industry. For more information, call Peter Lange, x30850.

**Cafeteria menu**—Entrees: barbecue link (special), liver and onions, broiled codfish, deviled crab, seafood gumbo. Vegetables: buttered corn, green beans, new potatoes.

## Aug. 29

**Space '88**—A Space '88 Conference focusing on engineering, construction and operations in space will be held Aug. 29-31 at the Albuquerque Hilton Hotel in Albuquerque, N.M. The program will include the presentation of more than 130 contributed papers on topics such as extraterrestrial operations, orbital operations and specialty operations. Speakers will include John Aaron, chief of the NASA Office of Exploration, STS-61B Mission Specialist Woody Spring, Dr. Michael Duke, program manager for construction experiments in space, former U.S. Senator and Apollo astronaut Dr. Harrison Schmitt, and Barney Roberts, manager of the JSC Exploration Studies Office. For more information, call Ray Leonard at (505)455-3484.

## Aug. 30

**ALT reunion**—A reunion is in the planning for former team members of

the Approach and Landing Test Program with the Enterprise, to be held at a time and date yet to be announced. Interested persons should contact one of the following before Aug. 30: Ron Lang, Beach Villas Apts. No. 303, Long Beach, Calif. 90802; or Daniel Jensen, 40022 Bluebird Lane, Palmdale, Calif. 93550.

## Aug. 31

**Flag football sign-up**—Registration for the men's Saturday flag football league will be at 7 a.m. for badged personnel and 5:30 p.m. for non-badged teams Aug. 31 at the Rec Center. The league will start play Sept. 10. For more information, call x30303.

## Sept. 9

**AIAA China trip**—A technical delegation from the Houston Section AIAA will depart for a trip to China to visit with the Chinese Society of Astronautics. Participants will meet with technical counterparts in Chinese space facilities at Beijing, Xian and Shanghai, home of Houston's sister section, the Shanghai Astronautical Society. Non-technical activities are planned for spouses. The delegation also will visit scenic and historic sites at Guilin and Hangzhou. For information on applications, call Jim McLane, 488-0312.

## Sept. 12

**Dance class**—Country and western dance classes will begin Sept. 12 and continue for six weeks, meeting from 7-8:30 p.m. each Monday at the Rec Center. Cost is \$20 per couple. Call x30303 for more

information.

## Sept. 15

**Apollo 14 workshop**—The Lunar and Planetary Sample Team will sponsor a workshop centering on Apollo 14 samples and the Apollo 14 landing site through Nov. 16 at the Lunar and Planetary Institute. Topics to be discussed include: regional geology of the Apollo 14 landing site; Apollo 14 plutonic rocks; and the relation of Apollo 14 lithologies to the magma ocean hypothesis and other models of early lunar differentiation. Abstracts for contributions are due at the LPI by Sept. 15. For more information, call Jeffrey Taylor, (505) 277-9159, or Paul Warren, (213) 825-2015.

## Sept. 17

**Deep sea fishing**—The JSC-EAA will sponsor a deep-sea fishing trip aboard the New Buccaneer departing Galveston at 7:30 a.m. and returning at 7:30 p.m. Tickets will be on sale through Sept. 16, and are \$40 to fish, \$15 to ride and \$15 for children 12 and under to fish. A limited number are available. For more information, call x35350.

## Sept. 22

**Mixed soccer sign-up**—Registration for the Saturday mixed soccer league will be held at 7 a.m. for badged teams and 5:30 p.m. for unbadged teams. League play will begin Oct. 1. For more information, call x30303.

JSC

# Swap Shop

Swap Shop ads are accepted from current and retired NASA civil service employees and on-site contractor employees. Each ad must be submitted on a separate full-sized, revised JSC Form 1452. Deadline is 5 p.m. every Friday, two weeks before the desired date of publication. Send ads to Roundup Swap Shop, Code AP3, or deliver them to the deposit box outside Rm. 147 in Bldg. 2.

## Property & Rentals

Sale: 1981 Wayside mobile home, 14x80, 3-2, 2 window units, all appl., FPL, wet bar. 484-0858.

Sale/Lease: Austin condo, 2 BR, W/D, microwave, all appls., \$650/mo. 723-5170.  
Lease: CLC 1 BR condo, ceiling fan, appls., exer. room, W/D conn., low dep., 2 wks free. Jim Briley, 488-7901.

Rent: Baciff, mobile home lot, \$85/mo., \$50 dep., Baker and Kinne. 488-1758.  
Sale: Inside lot at Rayburn Country, Jasper, Tx., 80' x 200', bargain. 645-0008.

Sale: League City, 3-2-2, cul-de-sac, landscaped, low equity, FHA 10% fixed assumable. David, x35464.

Sale: Pearland, lot in Dixie Hollow subdivision, concrete street, all util., \$10,000. x39530 or 482-5003.

Sale: Kirkwood South, large custom 2-story, 4-2.5-2, 2,400 sq. ft., formals, family room, FPL, study, intercom, oversized cul-de-sac, near Dobie H.S., \$76,500. 488-5210.  
Sale: Lake house, 2 acres, wooded, private lake, 2.5 mi. from Livingston, 3-2, A/C, furnished, \$45,000. 472-3103.

Lease: Pebble Brook condo, 1 BR, FPL, upstairs, pool, tennis courts, co-op lease avail., \$325. 681-4732.

Lease: League City, 4-2-2A, FPL, fans, blinds, pool, tennis, park, \$650. x38842 or 554-2434.

Lease: Baywind I condo, 1-1, new carpet, fresh paint, avail. immed., \$275/mo. x36692 or x36216.

Sale: Brookforest (CLC), 4-2.5-2, spacious contemp., approx. 2,500 sq. ft., both formals, lg. MBR, db FPL, landscaped, near schools, \$134,500. 488-7224.

Rent: West Galveston beach house, 2-2, boat landing, marina w/pool, \$500/wk., weekend rates avail. Fendell, x31206 or 538-1147.

Rent: Meyerland/Willow Bend, 3-1.5-2, fenced, den, mini-blinds, W/D, fans, near Medical Center, ref., \$475. & dep. John, x32236 or 723-1806.

Sale: Texas City, 4-2-2A, 2,200 sq. ft., all brick/rock, FPL, storage house, ex. large lot, \$89,900. 534-1931.

Sale: La Porte, Fairmont Park, 3-2-2, \$3,000 equity, no qual. assum., low closing, \$630/mo., fixed 10%. 471-8776.

Sale/Lease: Forest Bend townhouse, 2-1.5-2CP, storage rm., W/D conn., refrig., patio, \$375/mo., or \$45K. 482-2138.

Sale: Heritage Park, 3-2-2, Stainmaster carpet, deck w/spa, & storage shed, 10.5% FHA assum., \$68,900. Ann or Joe, 996-0289.

Rent: Galveston, Victorian gulf-front condo, sleeps 6, fully furn., 2 swimming pools, 3 whirlpools, tennis courts, afford. rates. 480-5270.

Sale/Lease: Condo, 2-2, split BR, plan, W/D, refrig., \$415/mo., \$35,000 cash. Rick, x36156 or 480-1218.

Sale: Middlebrook, 3-2-2, FPL, wet bar, covered patio, large lot, FHA assum. 10%, \$81,000. 480-9363.

## Cars & Trucks

'80 Cadillac Sedan de ville, brown w/tan vinyl top, loaded, ex. cond., \$4,000. OBO. x31808 or 488-1048.

'79 Buick Park Avenue, 2-DR., V-8 403, A/C, moon roof, AM/FM cass. 333-1304.

'86 GMC Safari van SLE, 2-tone, below book, 38K mi., fully loaded. Bob, 335-6066 or 486-1766.

'79 Camaro, new paint, black/red int., new tires, ex. mech. cond. 280-7625 or 486-7590.

'59 Mercedes Benz 220S, \$3,000. David, x35464.

'61 Volvo B1600, eng., needs little work, will run. 474-9666.

Toyota truck camper, alum., ex. cond., fits longbed, built-in cab. to fit in bed, \$200. OBO. Audra, x39174 or 534-3212.

'75 International Scout XLC, 350 Chevy eng., 350 Turbo trans., Dana Posi-Trac rear end, less than 5K on drive train, Bikini & soft top, \$2,500. 332-5057.

'82 Starcraft pop-up camper 1706XL, sleeps 6, ex. cond., \$2,500. 488-4915.

'86 Nissan Stanza wagon, auto., P/S, P/B, cruise, AM/FM, A/C, \$7,200. x37147 or 484-6630.

'87 Chevrolet Cavalier, 2 dr., 5 spd., P/S A/C, AM/FM cass., silver w/black int. Laurie, x39173 or 488-3647.

'83 Dodge Aries, A/C, P/S, P/B, P/W, AM/FM, clean eng. rebuilt 4/88, \$1,500. Elaine, x36652 or 333-4961.

'80 Pontiac Bonneville, 4 dr., V-6, runs good, \$1,995. x36156 or 480-1218.

'87 CRX Honda, 5 spd., A/C, AM/FM cass., ex. cond., \$9,500. 573-1896.

'27 Nash, motor runs, body complete but not on car. Cathy, 488-1450 or 479-7915.

'84 Camaro Z-28, red, approx. 38,500 mi., T-tops, all power, clean, runs good, \$6,995. 282-3817 or 482-6197.

'71 Porsche 914, ex. cond., Blaupunkt AM/FM cass., mag wheels, \$4,500. Greg, 488-5015.

'83 Posche 944, ex. cond., silver, 5 spd., sun roof, 43,000 mi., alarm sys., \$14,000. Frank, x36221 or 333-5251.

'86 Pontiac Firebird, V-8, AM/FM cass., 5 spd., A/C, P/S, P/B, tilt, 27,500 mi., \$7,300. Lea Anne, x31598 or 486-6762.

'83 Toyota Celica GT, auto., O/D, A/C, 67K mi., \$4,750. 488-5019.

'72 Chevy Malibu 350, runs good, new tires, BO. Joyce, 488-1450 or 488-7890.

'86 Jeep Cherokee Laredo, 2WD/4WD, loaded, 26K mi. 280-0144.

'88 Buick Skyhawk Wagon, 4 cyl., blue, 4,100 mi., like new, loaded, 6 yr. GM warranty, \$11,900. BO. Greg, 282-4263 or 488-2082.

'80 Toyota Supra, auto., A/C, sunroof, louvers, all pwr., 81K mi., ex. cond., \$3,000. 486-1865.

'85 Posche 356A Coupe, 1964 eng., \$6,000. David, 554-2992.

'82 Camaro Berlinetta, A/C, P/S, cruise, AM/FM, blk., orig. owner, \$3,995. OBO. Wait, x35939 or 280-8915.

## Cycles

Yamaha Moto 4, four wheeler, ex. cond., \$800. 482-4365.

'80 Honda 200 Twinstar, ex. cond., 7K, \$500; '72 Honda 450 CC, needs brakes, clutch and throttle cables, \$225. x34270 or 337-1896.

## Boats & Planes

15' center console with 25hp Evinrude, galv. trailer, trolling motor, less than 100 hrs. on new motor, asst. access., \$1,800. Don, x39475 or 941-1537.

Trailer suitable for 15' or smaller boat, ex. cond. Hauck, x32751.

10' Kayak collapsible to 10'x12", good cond., \$85 cash. x34270 or 337-2682.

Shakespeare trolling motor, 3 spd., \$75. 280-8796.

Lease: Floating boat slip, Portofino Harbour, avail., now, up to 40', 5 min. from bay. Ritz, x38501 or 780-2391.

'81 Newman-Cam II, 16' runabout, 100hp outboard, w/trailer, ex. cond., \$3,800. OBO. 480-9363.

## Audiovisual & Computers

Lets Make a Deal! Commodore 64 computer & peripherals. Will Seay, 282-2808 or 488-4878.

Sweet-P Model 100 Plotter, never used, \$80; B/W monitor, \$50. x37137 or 280-9441.

Altec Custom voice of the theater sound reinforcement speaker sys., \$1,000. 480-9363.

IBM (PCXT) Compatible, 640K, 2 floppy, color monitor, Hercules card \$600; radio control equip., 2-transmitters & an airplane. Kent, 484-2411.

## Household

Whirlpool washer, 2 spd., 4 cycle, super capacity, Whirlpool dryer, 5 cycle/3 temp., heavy duty, almond, 3 yrs. old, \$395. Jack, x35888 or 554-2340.

King sz. bed, matching frame, boxsprings & matt., used two mo., ex. cond., \$150. Kevin, x33650 or 482-2405.

9 drawer triple dresser, dk. wood, carved drawers/drs., matching mirror, 1 yr. old. \$175. OBO. x31653 or 532-3008.

Recliner chair, \$10. Richeson, x37005.

Sears Kenmore 70 Heavy Duty Plus, washing mach., tank leak only, \$70. 486-5207.

Queensize waterbed, reduced motion matt. w/heater, mirrored headboard, railpads, \$2,900. x38524.

Upright freezer, 16 cu. ft., \$175. 585-8162.

Wards microwave oven w/temp. probe, 20 auto sensor modes, ex. cond., full size, \$275. Bob, 280-1500 (x3066) or 482-9168.

'87 Kenmore trash compactor, ex. cond., \$200. 480-8142 or 484-0858.

6524.  
Sleeper sofa, queensize, new matt., 5 yrs. old, \$50. Wolf, 333-6564 or 482-3824.

9 piece solid cherry dining room, table, 6 chairs, 2 china cabinets, \$1,150. 534-1931.

Sectional sofa w/queen sleeper, tan, incliner w/corner table, \$1,000. OBO. Lynn, x39337 or 554-4365.

## Musical Instruments

Fender Mustang guitar, w/case, Peavy practice amp, w/reverb., both \$300; trumpet w/case, appr. for school band, \$125. Ross x38411 or (409) 925-6424.

Casitone MT-520 musical keyboard, still in box, \$125. OBO. Kevin, x36650 or 482-2405.

Calato new 4-pc drum practice set, \$130; Slingerland bass drum pedal, \$60; Sabian 16" crash/ride cymbal, \$60. x37137 or 280-9441.

## Pets & Livestock

Sale/Trade: Pocket parrot (Canary-winged Bee-Bee), sweet disposition; 9 mo. old miniature Schnauzer, AKC, reg., gentle, all shot records. 331-9441.

Cute and cuddlesome bay ferrets, \$45 ea., delivery avail. 488-2502.

Oceanic aquarium (30 gal) w/lamp and stand, all access., undergravel filter, power head, Magnum 330 diatom filter, many extras. Carlos, x38879 or 554-7727.

Chow puppies, born 7/7/88, full blooded, 3 red, 1 black, all female, \$125 ea., ex. bloodline. x37815 or 486-6747.

Free kittens; 18 puppies need a home, mother Golden Retriever; father, black Lab, puppies are black with white markings. 482-7642.

Australian shepherd, Heeler cross puppies, cow dogs, will be ready 8/17, \$60. 554-2627.

AKC registered German Shepherds, born 5/30, beaut. markings, (4), 2 all black. Billie, 482-4365.

## Wanted

Need occasional ride to work from La Porte, work hours are from 8 a.m. to 4:30 p.m. x39137 or 471-2258.

Need ride from A.C. Collins Ford area on Richey to JSC, hours are 8:00 a.m. to 4:30 p.m., location is Bldg. 4. Christine, x52892.

Need witness to auto accident, El Dorado at Eastcape Wednesday July 27, 12:30 noon, no injury, need verbal statement to determine insurance comp. Ron, 280-7428.

Need ride to work Mon.-Fri. from Avenue E., SH to NASA/JSC - bldg. 1, arr. 8:30 a.m. and leave 5:00 p.m., share gas expen. Terri, x30966 or 943-8431.

Sax player needed for Jazz/Rock/Pop Quintet. Must be able to play leads, ad lib solos, and meet w/ly. rehearsals w/exp. group for sched. performances. H. Barnes, 488-6141.

Need riders for van pool, South Post Oak & Braeswood, to NASA, Richard, x37557.

## Personal

Purchase my life membership in Great Expectations video dating, it remains transferable for you to sell later, cost 60% off current price. Ben, 280-7336.

## Miscellaneous

Midwest Sweet Stick radio control airplane, w/O.S 45 & muffler, \$150. Carlos, x38879 or 554-7727.

Comer day bed group, table & 2 beds, \$95. OBO.; Clip Clop hobby horse, \$55; 3 globe swag lamp, \$75. OBO. Boyd, 488-8806 or 482-5274.

Membership in San Jo Cove Recreation Center, Lake Conroe, for sale. 550-4112.

Front pair KYB Gasadjust shocks, fits 73-78 280Z, \$30; catalytic converter fits any auto., \$25; 24% leaded crystal by Triffin orig. \$30 per stem "Encantu Platinum", 8 stems per set, 2 sets ice tea & champagne, very nice, \$150. Don Thompson, x39475 or 941-1537.

'52 AMI jukebox, complete oper. man. & schematics, fair cond., \$250. Craig, 282-3731 or 485-5636.

4 bicycles, 3 spd. ladies 27", \$20; ladies 27", \$15; mens 27", \$15; boys 20", \$10. x34109 or 946-6814.

Sofa and loveseat, dark multi colors, lots of pillows, ex. cond., \$300; Ajay exercise bicycle, speedometer, odometer, adjust seat, 214 mi., ex. cond., \$60. Denise, 484-7247.

Kenwood stereo, good cond., \$700. OBO. Rick, x36156 or 480-1218.

Radio controlled spd. boat, 3' w/Picco P67 eng., Futaba radio & all access., never used, \$350. 334-2335.

Rare Colt AR15-AZ, still in box, cal., .222 Rem., fifty in U.S., \$750. OBO; Hungarian AKS new, 7.62 x 39 mm, folding stock, \$500. OBO. 464-8694.

Approx. 70 hvy.-duty moving boxes, all sz., 50c ea. or all \$30. Ray, x33954.



JSC Photos by Jack Jacob

**Modal Test Consultant Walt West, center, and Mike Grygier, right, locate a stressed area on the Cessna test article's frame through a computer display in Bldg. 49'S Vibration and Acoustic Testing Facility. The facility is working with vibrations as a method of inspecting airframes.**

# SHAKE DOWN: Vibration testing helps find structural weaknesses other methods fail to detect

**By Marie Simon**

Special to the Roundup

Engineers in Bldg. 49's Vibration and Acoustic Testing Facility are using a stripped down Cessna airplane to refine an inspection method that uses vibrations to find weakened spots in the metal frames of Orbiters.

Vibrations travel through metal somewhat like waves through water, and the disturbance in those waves caused by a structural flaw or weakness shows up when they reach the "shore," in this case a host of motion sensors placed at strategic locations on an airframe. When analyzed, these disturbances can pinpoint the location of a weak spot or flaw.

Vibration testing, formally called modal analysis, has already proven its benefits and potential, said Al Gist, manager of the Vibration and Acoustic Test Section. When more conventional checking methods, such as visual, ultrasonic and x-rays, failed to find a flaw in an Enterprise body flap at Dryden Flight Research Facility in 1980, modal analysis at JSC succeeded. Using vibrations, engineers discovered fatigue damage in a body flap of the flight test orbiter in the JSC test facility. Fatigue damage is a problem inherent in any metal frame that must flex and is caused by repetitive shocks, much like

a paper clip weakens when bent back and forth.

The discovery of fatigue damage resulted in a design change, and it made the possibilities of vibration testing clear. Vibration testing is not normally used by itself, but rather as a supplement to

other methods. Its attributes include the fact that it requires no disassembly of the structure being tested, said Modal Test Consultant Walt West. Also, the test requires only about eight hours to complete, making it relatively cost-efficient, he said.

"It's feasible and practical," Gist said.

"With modal testing, we are capable of understanding the dynamic behavior of complex structures with a minimal expenditure of time."

Vibration and acoustic testing have seen dramatic improvements as inspection tech-

niques during the past 10 years. At first, the tests were only used on small, fairly simple structures. But the method has now proven useful on extremely complex structures.

The JSC engineering team has now completed a series of laboratory vibration

**'It's feasible and practical. With modal testing, we are capable of understanding the dynamic behavior of complex structures with a minimal expenditure of time.'**

**—Al Gist**

tests on the Cessna aircraft, into which faults are deliberately induced. While the tests are under way, all other work on the subject airframe must be stopped to avoid interference with the ultra-sensitive motion sensors. After the low-level vibrations are picked up by the sensors, their readings are fed into a

computer that generates a graphic image of the frame.

The test results are compared with the original data to check the integrity of the airframe, and the research is paying off.

"We can work on much larger, more

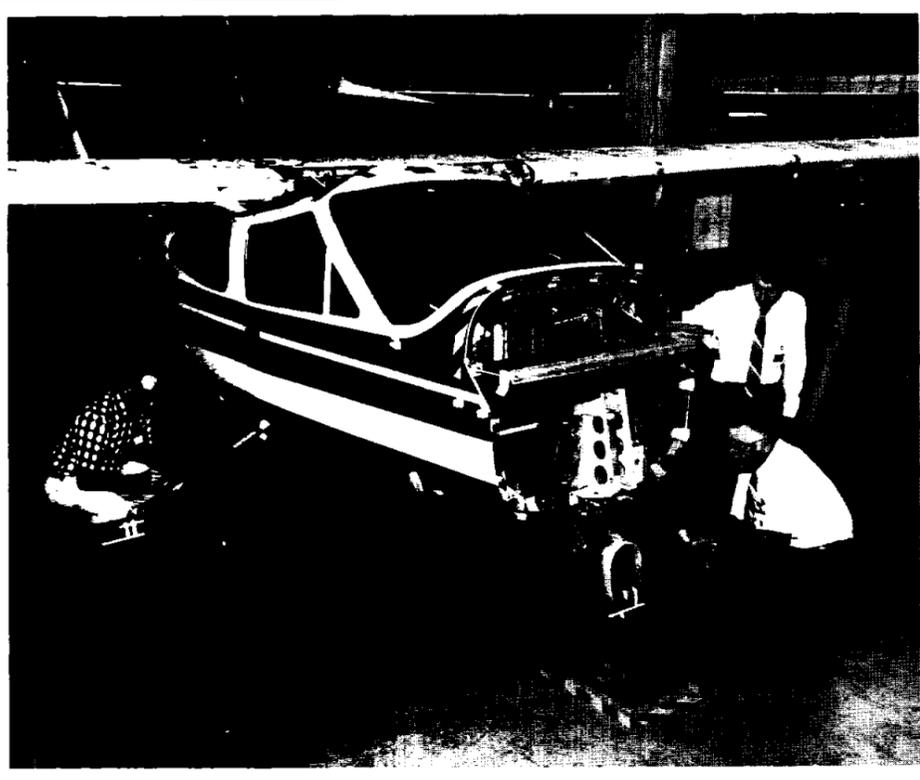
complex structures in a number of different environments now," said Stan Weiss, Subsystem Manager of Orbital Structure.

In addition to its spacecraft applications, modal testing has become a tool for engineers working in a variety of areas. The concept has been used in the oil industry in Europe and the U.S., and as an inspection method for rotating machinery and bridges. The inspection technique has proven itself, and has been credited with preventing problems on oil rigs in the North Sea before they ever occurred. It also has been used in power plants, and the Navy has experimented with the testing as an inspection method on their submarines.

Vibration testing eventually may be used to inspect parts of Space Station Freedom.

The JSC team has advanced vibration testing from a very limited beginning. At first, a mathematical model had to be used to interpret the outcome, reading frequencies one by one. Now, a process called "random excitation" allows all the various frequencies to be viewed simultaneously.

The use of vibrations and shocks as an inspection method is "an advancement in state of the art technology. It's the way to go," West said.



**Above: The modal analysis test crew, Hugh Harrington, left, Walt West and Mike Grygier, inspect the Cessna test aircraft's mountings. Vibrations traveling through the frame are picked up by motion sensors and interpreted by computer. Right: The test crew checks instrument locations on the aircraft's frame.**





This year, the JSC Office Education Program presented graduation certificates to 52 area high school students during a ceremony at the Gilruth Recreation Center June 28.

## 52 graduate Office Education

About nine months of work at JSC were finished by 52 graduates of the Office Education Program from 15 Houston and surrounding area high schools this year, Freda Marks, program coordinator, said recently.

The students began work in September 1987 and a graduation meeting was held June 28, where participants were presented with certificates. The students' work earns them class credit at school, and after graduation in May, they are allowed to work at the center through the summer, Marks said. Most Office Education students are high

school seniors, but some are juniors, she said.

JSC has had an Office Education Program for about 20 years, and students work in all areas of the center in clerical positions. Each year, the center receives more than 85 requests from various organizations for the 52 available positions. Already, 27 of the upcoming positions have been filled, she said.

The Office Education Program is good for both the center and the students alike, she added. "The students fill a critical clerical shortage

here, and they perform a variety of duties, from typing to answering phones to running miscellaneous errands."

At the end of their terms, students fill out evaluation forms and describe their experiences at the center. "The OE Program is an excellent program," wrote one student. "It has taught me many things, not only in the business field but about myself. I feel very honored to have taken part... everyone involved in this program is very caring and has a great willingness to help in any manner."

## Space students convene Thursday

By Marie Simon

Special to the Roundup

Students for the Exploration and Development of Space (SEDS), the largest student-run space group in the world, will host their 1988 International Conference at the Nassau Bay Hilton starting Thursday with the theme "Space for all Nations."

SEDS, a global network of space enthusiasts, aims to foster the public's interest and awareness of the social and technological benefits of space exploration through this year's convention. The agenda includes a space exposition, an astronaut barbecue, tours of JSC and seminars by leading space experts.

Kicking off the convention, Astronaut Dr. Story Musgrave will present a short lecture and slide presentation on "Human Experience of Space Flight" at 8 p.m. Thursday at the Hilton followed by a 9 p.m. welcome hour.

A panel featuring Dr. James Oberg, Nathan Goldman and Art Dula will discuss "Orbital Political Science" at 9 a.m. Aug. 26 at the Hilton, focusing on new governmental and legal structures necessary to live and work in space. Oberg, an expert on Soviet space policy, will cover the Soviet side; and Goldman and Dula, space law experts, will discuss international and legal frameworks to accomplish the international entry into space.

Joseph P. Loftus, JSC director of planning, will welcome the SEDS convention to JSC at 11 a.m. Aug. 26 in the Bldg. 2 auditorium and tours will begin at 11:30.

A Texas-style barbecue for conference attendees, JSC employees and astronauts will follow the tours at 5 p.m. in the Gilruth Recreation Center Pavillion. Today is the deadline for reservations; tickets are \$10 each.

On Aug. 27, a Space Exposition will

be held from 8:30 a.m. to 4 p.m. at the Hilton. Students will present their areas of research during student paper presentations at 9 a.m. Research subjects range from space life sciences to solar sails, and the papers will be presented forum-style.

Other scheduled events will include:

- Astronaut trainer Jim Newman will speak on "Crew Training at the Shuttle Mission Simulator" in an insight lecture at 11:30 a.m. Aug. 27.

- The Arthur C. Clark Award Banquet will highlight the conference at 7 p.m. Aug. 28. Award recipient Dr. R. Lynn Bondurant, chief of the educational services office at Lewis Research Center will be the keynote speaker. Today is the final day for reservations; tickets are \$24 each.

- A panel discussion on the "Future of Commercial Space Activities" will be held at 9 a.m. Aug. 28.

## Solid firing checks out redesign

(Continued from page 1)  
10-inch by 1.7-inch area of artificial edge separation in the case clevis insulation located counterclockwise from the pressure-ensuring flaw, plus a 5-inch by 0.175-inch artificial edge separation was put in the case tang at the end of the capture feature, located clockwise from the pressure-ensuring flaw.

In the aft field joint, PVM-1 had a 0.5-inch by 0.1-inch channel-type flaw cut into the J-seal bonded insulation

which, in turn, was aligned with a flawed capture feature O-ring. The two flaws were to assure pressure as far as the primary O-ring.

In the case-to-nozzle joint, engineers put in an hourglass-shaped 0.125-inch by 0.05-inch blowhole flaw cut through the polysulfide adhesive and aligned with a flawed wiper O-ring. In addition, there were two 10-inch by 0.4-inch areas of edge separations in the case insulation on either side of the pressure-ensuring flaw.

A nozzle internal joint had a 9-inch by 0.087-inch intentional void in the room temperature vulcanizing rubber sealant to ensure pressure from the flexible boot cavity reached the primary O-ring.

The PVM-1 motor was fitted with almost 400 instruments to measure acceleration, pressure, deflection, thrust, strain, temperature, electrical properties and other conditions.

The motor faces one more test, a cold-weather firing in December.

# White Sands has major repair role

(Continued from Page 1)  
initiate their development of methods to plug the leak."

When Rockwell engineers proposed cutting through the walls of the Orbiter's payload bay and Orbital Maneuvering System pod to reach the leak, the team at White Sands put the idea in practice. "We cut these holes in the test article's upper bulkheads to provide the same access that would be available to a repair crew at the launch pad," Saulsberry explained. "The test article tubing was flight type, but we added simulated wiring, additional brackets, and insulation."

White Sands did the literal nuts and bolts work to ensure that the clamshell device and the procedure for its installation, the method now being used on *Discovery*, were practical. "Our engineers simulated the proposed inspection and repair processes and demonstrated that inspection of the faulty dynatube fitting, torquing of the dynatube, installation of a clamshell, and filling of the clamshell were all possible," he said. "A video tape of the simulated repair processes was viewed by Headquarters, JSC, Kennedy, Marshall and Rockwell Downey, providing early insight on the possibilities."

The techniques used to torque the leaking dynatube fittings both at ambient and full pressure were developed at White Sands. Design Engineer Kevin Farrah and Senior Technician Greg Hall were then called to Rockwell Downey to demonstrate the torquing techniques to Rockwell management and RCS Subsystem Manager Gene Grush.

The two versions of the clamshell device developed by JSC and Rockwell also were evaluated using White

Sands' facilities. The feasibility of installing both the hinged JSC clamshell and the non-hinged Rockwell clamshell through the holes cut in the bulkheads was verified, Saulsberry said. Furmanite and RTV, two sealants that were leading candidates for clamshell packing, went through exposure and impact sensitivity testing in White Sands' material testing facility.

Another option for repairing the leak from inside-out, by threading through the oxidizer vent line, was developed at Marshall but required the expertise available in White Sands. Propulsion Test Engineer Ken McGuire traveled to Huntsville, Ala., where he assisted with the alternative repair's testing and development.

But even before working with possible repairs, White Sands personnel had already been busy developing ways of pinpointing the leak's location and any defect in the dynatube fitting. Leak detection techniques evaluated at White Sands included the use of an Interscan nitrogen tetroxide analyzer with a sample tube, a mass spectrometer, and a digital thermal camera system. Once located, White Sands helped devise possible techniques for studying the leaking dynatube fitting, among them the use of a video probe, radiography, dye penetrate, magnetic particle examination, and a new helium-neon laser.

Of the detection techniques studied, the Interscan analyzer with a teflon sample tube proved to be the best tool for finding the leak because it was portable, simple to use and could easily pinpoint the leak to within a fraction of an inch, Saulsberry said. Nearly all of the methods for studying the dynatube fitting proved workable.

## Crew press briefing set Monday

(Continued from Page 1)  
NASA management and organization plus the actions taken by the agency to meet the recommendations of the Rogers Commission.

The briefings will continue with an STS-26 crew press conference at 1

p.m., followed by a briefing on the mission's primary payload, Tracking and Data Relay Satellite C (TDRS-C) at 2:30 p.m. Presentations by several officials on secondary payloads to be aboard *Discovery*, beginning at 3:30 p.m., will wrap up the briefings.



VP CANDIDATE—Democratic vice presidential candidate Sen. Lloyd Bentsen, center, was escorted by Astronaut Hoot Gibson, right, and JSC Director Aaron Cohen on a brief tour of the center Monday.

## Wednesday teleconference to link JSC with Japan

JSC computer experts will burn the midnight oil early Wednesday morning to participate in an international teleconference that will link Japan and Houston for a few minutes of shared technology.

The two-hour teleconference on fuzzy computer system applications and technologies will be the finale of an international workshop at the Kyushu Institute of Technology in Iizuka, Fukuoka, Japan.

"It's a unique opportunity for JSC," said Robert Brown, chief of the Technology Development and Applications Branch and the JSC moderator for the teleconference.

The conference will begin at 1:55

a.m. Wednesday here, 3:55 p.m. Wednesday in Japan.

About 20 individuals will monitor the teleconference at JSC, Brown said. Demonstrations of fuzzy system applications will be presented by participants on both ends of the telecommunication system.

Fuzzy logic is a revolutionary new approach to computers which is not as precise as conventional computers. Slight, "fuzzy" adjustments can be made to problems.

Brown likens fuzzy logic to the reactions of a person driving on the highway. To keep the car in a lane of traffic, slight adjustments of the steering wheel are made almost

constantly — nudge to the right, a small jerk to the left — but if the driver drifts out of his lane, he can make a dramatic turn on the wheel to center the car once again.

There are no definite measurements that can be applied to the reactions of the driver. The reactions are fuzzy.

Fuzzy logic could be used to give the Shuttle autonomous control. In the lab, Bob Lea, also of the Technology Development and Applications Branch, uses fuzzy logic to simulate piloted flight and to cruise a computer-simulated orbiter around a satellite, adjusting the orbiter's azimuth and altitude.

Fuzzy logic is based on being able

to describe terms now useless in computer logic, such as almost, many, several, few, fast and slow, mathematically.

Brown said a number of other complex applications could use this kind of "non-deterministic" reasoning.

Processing fuzzy logic on conventional computers, however, is slow because computers are designed for more precise commands. Special hardware and chips are being developed by the Japanese so fuzzy logic can be used faster and easier.

"It allows us to develop controlled capability a lot simpler than in the past," Brown said. "Implementation of the hardware will allow us to make human decisions at a rapid rate."

## Space News Roundup

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